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Resolving the Anti-Antievolutionism Dilemma: A Brief for Relational Evolutionary Thinking in Anthropology

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Abstract: Anthropologists often disagree about whether, or in what ways, anthropology is "evolutionary." Anthropologists defending accounts of primate or human biological development and evolution that conflict with mainstream "neo-Darwinian" thinking have sometimes been called "creationists" or have been accused of being "antiscience." As a result, many cultural anthropologists struggle with an "anti-antievolutionism" dilemma: they are more comfortable opposing the critics of evolutionary biology, broadly conceived, than they are defending mainstream evolutionary views with which they disagree. Evolutionary theory, however, comes in many forms. Relational evolutionary approaches such as Developmental Systems Theory, niche construction, and autopoiesis–natural drift augment mainstream evolutionary thinking in ways that should prove attractive to many anthropologists who wish to affirm evolution but are dissatisfied with current "neo-Darwinian" hegemony. Relational evolutionary thinking moves evolutionary discussion away from reductionism and sterile nature–nurture debates and promises to enable fresh approaches to a range of problems across the subfields of anthropology.

Keywords: evolutionary anthropology, Developmental Systems Theory, niche construction, autopoeisis, natural drift

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Anthropologists often disagree about whether, or in what ways, anthropology is "evolutionary." However, some anthropologists who support evolution but criticize mainstream "neo-Darwinian" thinking have been called "creationists" or have been accused of being "antiscience." As a consequence, I argue, many anthropologists struggle with an "anti-antievolutionism" dilemma: they are more comfortable opposing the critics of evolutionary biology, broadly conceived, than they are defending mainstream evolutionary views with which they disagree. Evolutionary thinking in biological science, however, comes in many varieties, including relational or "process" perspectives that neither repudiate science nor embrace creationism. These perspectives decenter mainstream "neo-Darwinian" claims, affirming and connecting, rather than explaining away, the achievements of anthropologists across the subfields. Such perspectives may even offer a way of resolving the "anti-antievolution" dilemma.

In the first part of this article, I review the struggle over what counts as scientific evolutionary thinking in anthropology, analyzing rhetorical tactics some anthropologists adopt in an apparent effort to avoid being targeted by defenders of mainstream evolutionary views. In the second part, I characterize the anti-antievolution dilemma, arguing that it will remain irresolvable as long as all parties to the struggle assume that "neo-Darwinism" is the only scientific account of

evolution. In part three, I challenge this assumption, describing alternative "dissident" positions in evolutionary theory, particularly those of developmental biologist Conrad H. Waddington, whose ideas foreshadowed relational evolutionary perspectives that have become prominent in recent years. In part four, I discuss three such perspectives—Developmental Systems Theory (DST), niche construction, and complex self-organization—and compare them with mainstream "neo-Darwinian" accounts. Finally, I conclude by reviewing the benefits that relational evolutionary perspectives can bring to anthropology.

Is Anthropology an Evolutionary Discipline?

The role that evolutionary thinking ought to play in anthropology has been debated for years. In 1994, biological anthropologist Matt Cartmill addressed a gathering of biological anthropologists, reporting that the relationship between biological anthropology and mainstream anthropology had "become a strange anomaly" (1994:1) and declaring that "for the first time in the history of our science, we are facing … a principled rejection by mainstream anthropologists of the evolutionary tradition that underlies everything we do—and that originally held anthropology together" (1994:3). In 2005, Daniel Segal and Sylvia Yanagisako also described "the growing epistemological divergence between different forms of anthropology, notably between biological and cultural approaches" (2005:7). For them, however, this divergence was no strange anomaly; on the contrary, they complained that, in their experience, "so-called biocultural syntheses" are in fact "acts of *reduction* … of the cultural-social to the biological" (Segal and Yanagisako 2005:11). As a result,

> calls for four-field holism and biocultural integration are often, in our experience, thinly disguised attacks on those strands of cultural-social anthropology—specifically interpretive and constructivist approaches—most visibly in tension with positivism … lumping any and all nonpositivist approaches to cultures and societies into the demonized category of "postmodernism." (Segal and Yanagisako 2005:12)

Linking biocultural integration with four-field holism, and both of these with positivism, also enabled Segal and Yanagisako to take aim at 19th-century unilineal social evolutionism. They insisted that four-field anthropology was "a carrier of the social-evolutionary figure of the division of humanity into a civilizational Self and relatively backward (less and pre-civilized) Others" and therefore "saturated with sentiments of settler-colonial nationalism" (Segal and Yanagisako 2005:8, 16). Breaking up four-field anthropology, therefore, could free cultural-social anthropologists from both the threat of biological reductionism and the taint of social evolutionism.

At the same time, Segal and Yanagisako's texts struggle to disentangle the evolutionary biology they want from the biological reductionism and social evolutionism they reject. Taken together, for example, the citations above suggest that "biological approaches" in anthropology are responsible for the "biocultural integration" that "often" reduces culture to biology and for "positivist" attacks on "nonpositivist approaches to cultural and society." Because anthropologists who take "biological approaches" in anthropology have long been committed to forms of Darwinian evolutionary theory, the conclusion might seem to follow that Darwinian

evolutionary theory stands condemned as a form of positivist science. But such is not the case. Consider the following passage from Yanagisako's chapter in *Unwrapping the Sacred Bundle*:

Sociocultural anthropologists, in particular, have grown increasingly critical of the racial and cultural hierarchies and political inequalities that are naturalized by evolutionist approaches to human diversity. This is not to say that sociocultural anthropologists reject Darwinian theories of human evolution, but rather that we reject explanations of human cultural and social variation that rest on untenable assumptions of "classical evolutionism."(Yanagisako 2005:80)

Yanagisako's broad indictment of "evolutionist approaches to human diversity" immediately exempts "Darwinian theories of human evolution," and she further qualifies her claim a few sentences later, noting that "there are, of course, notable exceptions to the way scholars in the four fields align themselves in this disagreement, and I do not mean to oversimplify the schism" (2005:80). Nevertheless, she names no biological anthropologists whose views align with her own, and no essay in *Unwrapping the Sacred Bundle* was contributed by a biological anthropologist.

Equally curious is Segal and Yanagisakos' assertion that anthropology's Boasian legacy matters only because it "served primarily to implode, rather than to extend or develop, an active line in physical anthropology—specifically, research into racial character and differences" (2005:13). They say nothing about the way research by Franz Boas and his students prepared the ground for the "new" antiracist physical anthropology—or biological anthropology—that took shape in North America after World War II. The recent work of Clarence Gravlee and his colleagues (2003a, 2003b), for example, illustrates the kind of contemporary biological anthropology that challenges biological reductionism. Critiquing recent reanalyses of Boas's classic work (i.e., Sparks and Jantz 2002), they defend Boas's original conclusions by relying not only on contemporary population biology but also on contemporary work by evolutionary biologists and biological anthropologists such as Richard Lewontin (1974), Barry Bogin (1999), Jonathan Marks (2002), and John Relethford (2002, 2003). Contemporary antiracist biological anthropologists have also taken on challenges that did not exist in Boas's day, actively wrestling, for example, with complex issues raised by the Human Genome Diversity Project (Reardon 2005) and, more generally, with the potentially oppressing and liberating possibilities offered by the entry of genomics into contemporary struggles over "race" and other forms of identity.

In fact, numerous biological anthropologists support Segal and Yanagisako's unwillingness to reduce culture to biology. Biological anthropologist George Armelagos, for example, in working with students and colleagues, has long criticized the biological race concept (e.g., Armelagos and Goodman 1998) and has brought a critical perspective to biological, medical, and bioarchaeological studies of human populations. A number of recent Wenner-Gren symposia have brought together biological anthropologists, cultural anthropologists, and others to address political economic perspectives on human biology (Goodman and Leatherman 1998); models of science, gender, and society in primatology (Strum and Fedigan 2000); anthropology in the age of genetics (Goodman et al. 2003); and the challenges of reductionisms in biological and cultural anthropology (McKinnon and Silverman 2005a). The Program for Dialogue on Science, Ethics, and Religion of the American Association for the Advancement of Science sponsored another collection, *The Origins and Nature of Sociality* (Sussman and Chapman 2004). In the volume,

contributors' backgrounds ranged across the natural sciences, social sciences, and humanities, and half were biological anthropologists, paleoanthropologists, and primatologists. The fields of medical anthropology and science studies have attracted biological anthropologists and cultural anthropologists who are neither "antiscience" nor "anticulture" and who work to situate the production of biological and anthropological knowledge in a culturally, socially, politically, and economically complex world (e.g., Franklin 2007; Haraway 1989, 1997, 2008; Lock 2001; Trevathan 2007).

Indeed, as I show below, British social anthropologist Tim Ingold has been involved for many years in an ongoing critique of received views about biological evolution, together with a search for theoretical alternatives outside the mainstream. He has learned, however, that collaborations among biological and cultural anthropologists that challenge mainstream interpretations in evolutionary biology are risky undertakings. Consider a collection of articles he coedited with biological anthropologist Kathleen Gibson (Gibson and Ingold 1993). Gibson, Ingold, and their contributors stepped back from standard accounts of human evolution to reconsider possible connections among a range of phenomena that do not figure prominently in such accounts, such as potential links among gesture, tool use, and language. Their book was denounced as "partisan," however, because it "marginaliz[ed] neo-Darwinian theory"; moreover, the "'holistic' way" it dissolved "primate-human distinctions" was labeled "creationism in a new guise" (Knight 1995:396). Or consider a 1990 conference entitled "Women Scientists Look at Evolution: Female Biology and Life History" that was subjected to denigrating misrepresentation in *Science* magazine (Dushek 1990). Although a letter to the editor attempted to correct these misrepresentations (Galloway 1990), negative repercussions shadowed this event and its participants for years. Nevertheless, the book that came out of this conference (Morbeck et al. 1997) received favorable reviews, in part because of its use of "nonmainstream" field data on life histories of actual primate females to critique formal life-history models in evolutionary biology (e.g., Altman 1998; Mealey 2000; Sinha 1998). In 2006, one of the contributors recalled the unpleasantness generated by the media distortions but remarked that in the intervening 16 years "supportive remarks supplanted disapproving quips" (Vitzthum 2006).

It was also in the year 2006 that two psychologists and one biologist—Alex Mesoudi, Andrew Whiten, and Kevin Laland—published a target article in the journal *Behavior and Brain Sciences* entitled "Toward a Unified Science of Cultural Evolution," in which they claimed that a

> growing body of theory implies that culture exhibits key Darwinian evolutionary properties. If this is accepted, it follows that the same tools, methods, and approaches that are used to study biological evolution may be productively be applied to the study of human culture, and furthermore, that the structure of a science of cultural evolution should broadly resemble the structure of evolutionary biology. (Mesoudi et al. 2006:329)

In the commentary that followed the target article, evolutionary psychologist Jerome Barkow observed that "the authors' proposal neglects most of sociocultural anthropology and related fields. What they include is worthy, but they pay scant attention to the likelihood that very few of the field's practitioners are interested in modeling their endeavor on *any* science, whether biology or meteorology" (2006:348). Barkow recommended turning "the bulk of existing sociocultural anthropology … into ore to mine and then to refine," seeking out "those bits and pieces that have

analogues in biology" and testing them "for compatibility with psychology (and biology, etc.)" (2006:349). Archaeologist Michael O'Brien, another commentator, asserted that social scientists "have often been downright hostile toward even considering cultural evolution in Darwinian terms" and have been "encouraged in this retreat by several prominent biologists and paleobiologists" such as Stephen Jay Gould and Ernst Mayr (2006:359). In their response to the commentaries, Mesoudi and colleagues agreed with Barkow and O'Brien's assessments but concluded with the hope that "the body of work that we have reviewed in this target article sends the message that there is now a clear, vibrant, productive, and rapidly growing alternative to this hostile-to-evolution, hostile-to-science tradition in the social sciences" and invited "social scientists frustrated with the negativity of post-modernist, deconstructivist, and other anti-scientific movements within their discipline to join us in building a scientific theory of culture" (Mesoudi et al. 2006:375).

Ingold (2007) has drawn attention to the version of "evolutionary biology" on which Mesoudi, his colleagues, and their supporters stake their scientific claims. "What passes as neo-Darwinism today," Ingold writes,

> is a far cry from the kind of programme envisioned by the architects of the so-called "new synthesis" of mid-20th-century evolutionary biology—giants such as Julian Huxley, Ernst Mayr and Theodosius Dobzhansky, all of whom engaged respectfully with leading anthropologists of their day (Ingold 1986). My concern here is with the neo-Darwinian paradigm in its contemporary incarnation, which is why, in the title of this article, I have placed "evolutionary biology" in quotation marks. This is intended as shorthand for "evolutionary biology as it is understood in the article by Mesoudi, Whiten, and Laland." (Ingold 2007:13)

As the citations above make plain, Mesoudi et al.'s version of evolutionary biology is presented to the world on a take-it-or-leave-it basis. To challenge it is to risk being labeled "hostile to evolution" and "hostile to science." Even Ernst Mayr and Stephen Jay Gould are in jeopardy.

The Anti-Antievolutionism Dilemma

On one hand, as Agustín Fuentes insists, "any anthropologists worth their salt should agree that evolutionary perspectives are important to understanding humanity and that culture does change over time (evolve)" (2006a:547). However, as Ingold observes, "nothing causes more trouble, in the attempt to integrate evolutionary biology with sociocultural anthropology, than 'evolutionary biology' itself" (2007:13). One way to make one's peace with this state of affairs is to adopt some form of what I call "anti-antievolutionism." Analogous to the "anti-antirelativism" identified by Clifford Geertz (1984), "anti-antievolutionism" describes the position of anthropologists who are more comfortable opposing the critics of evolutionary biology, broadly conceived, than they are defending "the neo-Darwinian paradigm in its contemporary incarnation" (Ingold 2007:13).

The texts by Segal and Yanagisako, analyzed above, appear to be wrestling with a version of this dilemma. On one hand, they have no objection to "Darwinian theories of human evolution" in general, even though they object to specific evolutionary claims made in Darwin's name (i.e., the

"social Darwinism" of "classical evolutionism"). However, to show skepticism about any claims made in Darwin's name could expose them to the charge of being "creationists" or "antiscience," even though they apparently respect the science responsible for "Darwinian theories of evolution" and do not defend creationists. They appear to seek a middle way that allows them to attack reductionist "biological approaches" in anthropology without using the word *evolution* or to use the word *evolution* to encompass both biological and cultural evolutionary theories but to aim their critique only at the latter. And it is always possible to muddy the waters by censuring "holistic four-field anthropology," as if it were responsible, all by itself, for this bewildering predicament.

As the intricate maneuvers of Segal and Yanagisako illustrate, however, walking the narrow anti-antievolutionism line is an imperfect solution. "So long as the answers do not involve a denial of evolution," observes Jonathan Marks, "it is all Darwinian. To that extent, then, I am for a Darwinian anthropology, although I confess I consider it a trivial proposition" (2004:182). Still, keeping one's head down may be sensible: in Ingold's opinion, anthropologists who do speak out against current evolutionary orthodoxy "cannot expect much support from anthropological colleagues, in whose eyes to meddle with 'evolutionary biology' is generally to be tarred with the same brush" (2007:15).

Polemics over the status of evolutionary thinking in anthropology, however, divert attention from a key question that regularly remains unasked: Is there only one "evolutionary tradition" on which anthropologists might draw? Cartmill, Chris Knight, Mesoudi et al., and many of their commentators leave the impression that this is so and that they are its defenders. The tension in Segal and Yanagisako's texts, however, suggests that they, too, believe only one evolutionary tradition exists and that this worries them. Therefore, they construct a convoluted argument that allows their use of evidence from evolutionary biology that undermines biological essentialism while simultaneously keeping at arm's length both the theory and the practicing biologists responsible for that evidence.

Evolutionary Thinking, Mainstream and Dissident

Is it true that evolutionary biology comes in only one "neo-Darwinian" version? Popular evolutionary accounts that lionize genes, the "master molecules" determining human destiny, suggest that the obvious answer must be "yes." Accounts of cultural evolution like that of Mesoudi et al. 2006, modeled on this "molecular paradigm" (Neumann-Held and Rehmann-Sutter 2006), would therefore seem to have undisputable scientific status. And yet, the obvious answer turns out to be wrong; the great successes of the molecular paradigm have had surprising consequences. Evelyn Fox Keller writes that the very success of molecular genetics has undermined genetic determinism (2000:5). Historian of science Hans-Jörg Rheinberger agrees: even though the human genome has been decoded, there is "still a way to go from genomes to organisms," and "the path from there to populations and communities … will not be shorter and left for still another generation" (2000:232). Neo-Darwinians like Mesoudi and colleagues, who now wish to extend the molecular paradigm to the study of cultural evolution, therefore, appear to have missed a watershed event in the history of evolutionary theory and practice.

Yet theory and practice in evolutionary biology have always involved more than the molecular paradigm. David Depew and Bruce Weber show that "phrases like *evolutionary synthesis* and *modern synthesis* are problematic and ambiguous" and have been used in multiple ways; moreover, in their view, the "synthesis" looks "more like a treaty than a theory" (1995:299–300). Population genetics, biogeography, systematics, and paleontology were the first to sign the treaty; botany joined in the late 1950s and early 1960s, and ecology in the 1960s. Sherwood Washburn helped bring physical anthropology (but not cultural anthropology) into the synthesis. Developmental biology was excluded, pending the advance of developmental genetics (Depew and Weber 1995:301). As Ingold remarked, some architects of the synthesis did speak respectfully with anthropologists and were unwilling to encompass cultural processes within their models of genetic evolution. But the successes of molecular biology in the 1950s and 1960s destabilized such positions, shifting attention from organisms to genes. One consequence was Richard Dawkins's"selfish gene" (1976) explanation of altruism; another was E. O. Wilson's "new synthesis," which proposed extending models of genetic evolution to cultural processes and which, as anthropologists know all too well, "has faced gales of resistance" (Depew and Weber 1995:301).

However, evolutionary-research traditions excluded from the synthesis nurtured "dissident" theoretical projects of their own (Depew and Weber 1995:278). Perhaps the most significant was Waddington's work in developmental biology. In his lifetime, as Keller writes,

> Waddington was something of an outlier. With one foot in genetics and the other in embryology, he had never belonged to the mainstream of either discipline; nor was he a participant in the new field of molecular biology. Moreover, as a committed follower of Alfred North Whitehead, he was a perennial critic of what he referred to as "the genetical theory of genes," seeking throughout his life to supplement that theory with a more dynamic and process-oriented "epigenetic theory."(2000:78)

In 1959, Waddington published an article in which he argued that biological evolution "is carried out by a mechanism which involves four major factors" or subsystems, each of which exerts its influences at different points in an organism's life cycle. Early in development, animals (if not plants) "are usually surrounded by a much wider range of environmental conditions than they are willing to inhabit," which means they must "select the particular habitat in which their life will be passed," thus incorporating themselves into "the exploitive system" (Waddington 1959:1635–1636). As they begin to function in their chosen niches, developing animals are then exposed to stresses that reveal certain potentialities; these responses are part of "the epigenetic system." According to Waddington, "those individuals in which responses are of most adaptive value" will be favored by *the natural selective system,* and mutation will modify the selected potentialities within the *genetic system* (1959:1635–1636). Where humans are concerned, Waddington identified a new mode of hereditary transmission, the cultural or "sociogenetic" system, that permitted humans to acquire capacities "[that], in the nonhuman world, could only have been obtained as the results of evolution" (1959:1636). To Waddington, the appearance of culture, however, did not mean that genes no longer mattered. He writes, "Human inventiveness and skill, just like any character of any organism, are produced by the interaction of genes with one another and with the environment during development" (Waddington 1959:1636). Still, as

Waddington points out, “human evolution has been in the first place a cultural evolution” (1959:1636).

Waddington's scheme is notable for at least three reasons. First, his suggestion that evolution encompassed several distinct systems foreshadows discussions of multiple inheritance systems that would appear by the early 1980s (see below). Second, his discussion of the “exploitive system” adumbrates the notion, proposed by Lewontin, that would come to be called “niche construction” (Lewontin 1982, 1983; Odling-Smee et al. 2003:29–30). Finally, his concern for the ways in which the events of development are consequential for evolutionary outcomes resonates with concerns raised by more recent theorists. Gould (1977) argued that some features of adult phenotypes were more likely a consequence of constraints encountered during development than of natural selection on genes. Such “spandrels” (Gould and Lewontin 1979) might, under changed selective regimes, become subject to natural selection in their own right, a phenomenon called “exaptation” (Vrba and Gould 1982). Susan Oyama (2000) challenged the notion that genes embodied all the “information” needed to build organisms by demonstrating in detail how such “information” is produced in the course of development. And William Wimsatt argued that genetic programming was not needed to explain why phenotypic features present early in development were stable: because organismic development is a sequential process, later stages come to depend on earlier stages (however generated), a phenomenon called “generative entrenchment” (Wimsatt 1986; Wimsatt and Schank 1988).

Alternative Evolutionary Frameworks: A Contemporary Classification

Anthropologists need to know that several alternative approaches currently circulate among scholars, scientists, and theorists interested in biological, cognitive, and cultural evolution. They go under a variety of sometimes confusing names, reflecting their origin in a range of debates in different disciplines. Philosopher of biology James Griesemer (2006) has sorted the most prominent of these approaches into three categories: structural perspectives, functional perspectives, and process perspectives.

Structural Perspectives

According to Griesemer, structural perspectives “model phenomena by representing structures. The most common structural perspective on units of evolution is that of a hierarchy of compositional levels of spatial organization: molecules, organelles, cells, tissues, organs, organisms, populations, species” (2006:201). Molecular genes play a central role in structural models of hereditary transmission offered by population biologists (Griesemer 2006:201–202). Different structural models do not concur about which (or how many) levels of the compositional hierarchy contain units subject to natural selection. All structural perspectives, however, face limitations because they assume, rather than investigate or demonstrate, the existence of hierarchical levels of composition and because they are unable to model biological development (Griesemer 2006:204).

Functional Perspectives

Functional perspectives in evolutionary biology attempt to connect compositional entities identified in the structural hierarchy with the genotypic and phenotypic functions recognized by the modern synthesis. Richard Dawkins (1983) distinguished "replicators" that serve the genotypic inheritance function by making copies of themselves from "vehicles" or "interactors" (Hull 1988) that serve the phenotypic interaction function by undergoing natural selection. But even though replicators and interactors perform key functions in evolutionary process, functionalist perspectives, like structural perspectives, take the evolutionary process itself for granted (Griesemer 2006:205). Functionalists also locate causes for both development and inheritance in replicators (i.e., genes in biological evolution). Phenotypic variation among interactors is assumed to map directly onto properties of the replicators they carry, so that selection on interactors directly determines the replicator inheritance passed onto the next generation. But functionalist models cannot demonstrate the covariance between gene–replicator and phenotype–interactor: "Only the coupling of statistical fates in the common cause suggests a single coherent process moving through time" (Griesemer 2006:206).

In the past 30 years, formal attempts to theorize cultural evolution as a Darwinian process have been influenced by functional models of biological evolution. Charles Lumsden and E. O. Wilson (1981) adopted a functional perspective in which adaptive social behaviors, previously considered socially or culturally learned, were reinterpreted as phenotypic outcomes of selection on genes. When Robert Boyd and Peter Richerson (1985) challenged Lumsden and Wilson, they not only critiqued their formal models but also offered formal models of their own, showing how natural selection on cultural variants could, in certain environments, promote the evolution of culture. Their demonstration also had structural implications, positing the existence of cultural units subject to natural selection that give rise to a second inheritance system alongside genetic inheritance. Other formal "neo-Darwinian" models of cultural evolution share this approach (e.g., Cavalli-Sforza and Feldman 1981; Durham 1991; Mesoudi et al. 2006). However, John Odling-Smee and colleagues (2003) posit three inheritance systems involving genes, memes, and artifacts, and Eva Jablonka and Marion Lamb speak of "evolution in four dimensions," distinguishing genetic, epigenetic, behavioral, and symbolic inheritance systems, all of which generate variation on which natural selection may act (Jablonka and Lamb 2006).

Functionalist perspectives on cultural evolution, however, ignore developmental processes (such as "enculturation" and "socialization") within which cultural "information" may become relevant to human agents; they also disregard the larger evolutionary process within which selection on cultural variants is supposed to take place. Functionalist models of cultural evolution also face the chronic challenge of identifying units of culture suitable for formal neo-Darwinian modeling. Fuentes observed, for example, that Mesoudi and colleagues "use the term 'culture trait' at least 27 times without offering an explicit definition," lumping together "diverse elements that may not share common structural components or patterns of heritability" (2006b:354; see also Ingold 2007:16). Thus, just like functional models of biological evolution, functional models of cultural evolution face a structural hierarchy problem. Cultural agents who select the QWERTY keyboard over alternatives are presumed to be operating in a setting not unlike a capitalist marketplace of ideas and commodities. But the structure of this marketplace—and the social, economic, political, and ecological scaffolding that sustains and supplies it—figure nowhere in the model. What kind of complex, heterogeneous, constructed world produces keyboards in the first place, and where did it come from?"Classical evolution" solved this problem by assuming

that cultural worlds with hierarchical structures appeared as automatic consequences of the laws of nature or history and did not need to be explained. But this solution is closed to a Darwinian perspective that rejects deterministic stagism, whether Spencerian or Marxian.

Do memes or cultural variants corresponding to genotypes exist "mostly inside people's heads" (Richerson and Boyd 2005), and do observable behaviors constitute the "phenotypes" of those cultural variants? A number of the commentators on Mesoudi et al. 2006, including many sympathetic to their project, do not accept their understanding of units of culture. Robert Aunger questions whether the replicator versus interactor distinction is even applicable to cultural evolution (Aunger 2006). As Eva Jablonka and Marion Lamb have observed, "when we imitate, what is copied is the 'phenotype' of the meme. … So even mechanical imitation is not equivalent to the replication of genes. And if imitation is not mechanical, if what is to be imitated is evaluated by the imitator, then imitation is a context- and content-sensitive process, not mere copying" (2006:211). What "copying" means in this context becomes problematic (Griesemer 2006:218), constituting a further limitation on functionalist accounts of cultural evolution.

Process Perspectives

Process perspectives identify "units of evolution with processes rather than with objects or functions" (Griesemer 2006:208). Taking for granted neither the structural hierarchy of compositional units nor the functional distinction between genotype and phenotype, they focus on the origin of these phenomena. That is, they address "the problem of evolutionary transition—the evolution of new (structural and functional) levels of biological organization" (Griesemer 2006:207–208)—a matter that structural and functional perspectives ignore and that Darwin did not address. Griesemer categorizes as process perspectives both DST and niche construction—the "recent enhancements of Darwinian perspectives" to which Fuentes refers (2006b:354). Ingold has incorporated insights from DST in his own work for some years now and was the only anthropologist to contribute an article (Ingold 2001) to *Cycles of Contingency* (Oyama et al. 2001a), the edited volume that serves as both an introduction to, and manifesto for, DST.

Developmental Systems Theory emerged from the efforts of psychologists, evolutionary theorists, and philosophers of biology who were interested in the evolution of cognition and highly critical of the way gene selectionism perpetuates the split between "nature" and "nurture." Insisting that the actions of genes cannot be understood in isolation from the machinery of the cells in which they are found, Susan Oyama, a key DST theorist, stresses "the necessity of viewing transactions between an entity and its surround as aspects of a single system" and a focus on the "mobile interchange" of organisms that alter their environments as much as environments alter organisms (2000:7). But Oyama and other DST theorists do not conceive of genes, organisms, or environments as self-sufficient, self-enclosed entities that "interact" with one another. Rather, all three are understood to be porous entities that enter into complex relations with one another within the developmental system that constitutes the life cycle of every organism; this is why DST is also sometimes called a "relational" perspective. Thus, development is understood "not as the reading off of a preexisting code, but as a complex of interacting influences, some inside the organism's skin, some external to it, and including its ecological niche in all its spatial and temporal aspects" (Oyama 2000:39). This is why DST theorists reject accounts of evolution that propose multiple separate inheritance systems. Instead,

they argue that “causal interactions among such processes are organized into a developmental system which behaves as a unit life cycle in replication” (Griesemer 2006:209).

DST incorporates niche construction (Oyama et al. 2001a) because niche construction draws attention to the ways in which organisms make themselves, in part, by making their own environments. Development within a constructed niche does not mean that organisms are somehow removed from the pressures of natural selection. Rather, the constructed niche alters the kinds of selection pressures they experience: they are buffered from some pressures but exposed to new pressures generated by the constructed niche itself. The agency of organisms is highlighted by niche construction, which includes the option to leave one's current niche and seek out another one: Odling-Smee and colleagues, for example, call this “inceptive relocational niche construction” (2003:64–65). Fuentes argues that Odling-Smee and colleagues’ understanding of niche construction “can be read explicitly as a solid argument for a constructivist evolutionary approach, one that is potentially largely anthropological in practice,” and urges that niche construction be recognized as “*a core factor in human behavioral evolution*” (2007:13, 16). Archaeologist Bruce D. Smith affirms that niche construction “provides an important evolutionary and behavioral context for understanding … the initial domestication of plants and animals,” because such a context removes “the proximate mystery. … Domestication was not the product of unusual ‘outside the envelope’ behavior patterns, but emerged out of coherent preexisting resource management systems” (2007:195–196).

Griesemer's second example of an evolutionary process perspective is “process structuralism,” which “emphasizes laws and generic (i.e., nonselective) outcomes of developmental processes as the basis for a rational and mature science of biology” (2006:209). Process structural approaches underscore the role of non-Darwinian processes of complex self-organization and emergence in the evolution and development of living organisms. Prominent process structuralists include Waddington's student Brian Goodwin, who rejects the notion that a genetic program guides organismic development. Instead, Goodwin argues that embryogenesis involves spontaneous shape formation, describable in terms of “rational,” physical laws at work within a “morphological field” that encompasses all the dynamic relations of the developing organism in its environment; genes simply set the parameter values within which morphogenesis may occur (1993:130, 136). Tim Ingold has used Goodwin's understanding of the genesis of organic form not only to account for the self-organization of living organisms but also, by analogy, to describe the genesis of social form out of the emerging relationships among persons in a social field (1990) and the growth of the form of artifacts as emergent the process of their manufacture (1990:221, 2000:345). Stuart Kauffman, another process structuralist, stresses the role of spontaneous self-organizational processes both during the transition from nonlife to life and in organismic development. Using computer simulations to demonstrate how “disordered dynamical systems” can yield “powerfully ordered dynamics,” Kauffman (1993:284) argues that “many features of organisms might reflect such self-organization rather than the handiwork of selection” but acknowledges that “natural selection is always at work in actual biology.” He concludes that what is needed is “a theory exploring how selection acts on, and modifies, systems with self-ordered properties, and to understand the limits upon selection” (Kauffman 1993:284).

Francisco Varela and colleagues (1991) modeled the evolution of cognition in terms of complex self-organization. Drawing on discussions of autopoiesis (or self-organization) in living systems by Varela and Humberto Maturana (Maturana and Varela 1980, 1987), they argued that self-organizing living systems are operationally (i.e., functionally) closed while remaining thermodynamically open to inputs of energy or materials. Varela and colleagues view developing organisms as agents generated from the densely interconnected, distributed agency of the elements out of which they are made. Nevertheless, living self-organizing systems cannot exist in a vacuum. Real minds, for example, conceived of as emergent and autonomous networks, are always "constrained by a history of coupling with an appropriate world. By enriching our account to include this dimension of *structural coupling,* we can begin to appreciate the capacity of a complex system to enact a world" (Varela et al. 1991:151). "Enacting a world" involves the autonomous network's responses to perturbations it encounters in its wider milieu: "Over time this coupling selects or enacts from a world of randomness a domain of distinctions … that has relevance for the structure of the system. In other words, on the basis of its autonomy the system selects or enacts a domain of significance" (Varela et al. 1991:155). As a result, for living systems, "the meaning of this or that interaction … is not prescribed from outside but is the result of the organization and history of the system itself" (Varela et al. 1991:157).

To analyze how "current or reliably reconstructed languages change over time," linguistic anthropologist William Foley (2007:1) has rejected "orthodox neo-Darwinism" in favor of "enactive evolutionary theories" such as autopoeisis–natural drift and Developmental Systems Theory. Foley values these approaches because they not only take into account "the traditional insights and discoveries of historical linguistics" but also offer new insights into issues that historical linguistics was unable to handle, such as "the demarcation between language community and speech community and the deconstruction of the notion of speaker" (Foley 2007:23). Autopoeisis–natural drift helps in two main ways. First, because it claims that environmental perturbations trigger, but do not specify, changes in the nervous system, it provides an alternative to representational theories of meaning (Foley 2007:4). Second, by embedding linguistic replication within "a network of communicative practices between two or more self-organizing unities, in realized linguistic practices," it articulates with contemporary views in linguistic anthropology that decenter the role of grammar (Foley 2007:13). DST, in turn, by highlighting "the multiple levels of interacting resources available for replication," offers Foley an alternative to gene-directed models of evolutionary process (2007:13).

Foley identifies a range of linguistic components functioning as replicators at different levels of linguistic organization, principally individual signs, individual languages, and individual speech genres. He likens biological species to individual languages, but only if the speech communities associated with them are conceived as ideologically defined "imagined communities" (Foley 2007:14). He likens a biological organism not to an individual speaker but, rather, to "the lineage of stances that a speaking organism co-constructs with its interactant(s) in co-development in social interaction," stances that themselves are "embedded in larger networks of replicating developmental linguistic resources, from a sign to a sentence to a genre to a language" (2007:19). Theorists of cultural evolution might note that although Foley speaks of "replicators," by identifying so many of them at different levels and by dissolving the "interactors" into components distributed throughout the system of structural coupling, his analysis in effect deconstructs the replicator–interactor distinction. Foley also cites Lewontin's (1983) discussion

of the organism as subject and object of evolution without using the term "niche construction," arguing instead that "the interrelation between organism and environment is the basis of natural drift" (Foley 2007:5).

Indeed, niche construction emerges as a richly suggestive notion capable of traveling across a number of functional and process perspectives in evolutionary thought. Griesemer describes the role of niche construction in DST "as a developmentalist research strategy for modeling 'environmental' resources in interaction with 'internal' organism resources" (2006:209), emphasizing those aspects of niche construction highlighted by Waddington's "exploitive system." But this interpretation exists in tension with attempts by Odling-Smee and colleagues to model niche construction for evolving populations using formal neo-Darwinian models (see Odling-Smee et al. 2003:chs. 7–9).[1] As noted above, Odling-Smee and colleagues have argued for the recognition of three inheritance systems involving genes, memes (cultural variants), and "artifacts," respectively. They define *artifacts* as products of niche construction: material features of the environment, such as beaver dams or termite mounds, that are produced by the activity of organisms. When organisms reconstruct environments, they pass down a legacy of modified selection pressures to future generations of developing organisms, either their own offspring or other organisms who depend on the modified environment for their own survival. In the view of Odling-Smee and colleagues, niche construction is as important an evolutionary process as natural selection; for it to take its rightful theoretical place, however, would require expanding and restructuring the modern evolutionary synthesis (Odling-Smee et al. 2003).

But niche construction has also been explicitly associated with complex systems theories. Anthropologist Terrence Deacon argues that the evolution of symbolic human language cannot be understood until theorists address "the complex self-organizing and evolutionary dynamics that form the very essence of its design logic" (2003a:81). Deacon invokes niche construction in his discussion of brain-language coevolution, insisting that language "is not just a passively constructed niche, like a beaver dam … but is a complex dynamic niche, with something like a 'life of its own'" (2003b:111). By contrast, anthropologist Stephen Lansing, inspired by Lewontin (2000), invokes niche construction to describe social institutions that "emerge from the bottom up, as a result of feedback processes linking social actors to their environments" (2002:287). Lansing's key example of a complex adaptive system as constructed niche is "the water temple networks with which Balinese farmers manage their centuries old irrigation systems and rice terraces" (2002:287). When Lansing and colleagues used data from Lansing's work on Balinese wet-rice agriculture to construct a computer model based on James Lovelock's Daisyworld simulation, they found that it "accurately predicts the actual structure of functional organization along two Balinese rivers" (1998:350).

Niche construction is important to Lansing because it highlights the shortcomings of "replicator dynamics" (2002:286), especially as they are used in artificial societies modeling. Lansing echoes Lewontin's complaints about adaptationist thinking in evolutionary theory: replicator dynamics neglects "the active role of organisms in constructing their own environments" and treats natural selection as "a one-way influence between organism and environment" that refuses to pay attention to feedback loops. But how to model these processes mathematically? Approaching niche construction from population genetics, Lewontin himself speaks of "the *co-evolution* of organism and environment in which both are acting both as causes and effects"

(2000:101), proposing a pair of coupled differential equations that must be solved together. Odling-Smee and colleagues, coming from evolutionary biology and ecology, have adopted both Lewontin's concept and his way of mathematizing it.

Lansing, however, approaches niche construction as a critical ecological anthropologist who, like Segal and Yanagisako, has inherited a 20th-century suspicion of all 19th-century master narratives of cultural evolution. He is also interested in the interplay of determinate and contingent cultural processes at levels of complexity that the methods of population biology are ill-equipped to handle. He wants to know how large-scale, intricate material and cultural structures emerge, develop, and maintain themselves over long periods of history—and what happens when unexpected historical conjunctures push them in unpredictable directions. "What we would really like to know," he asks, "and what descriptive statistical methods alone usually cannot tell us, is the likelihood of a given outcome, a given social reality. 'What if the evolutionary tape were run again?' as Stephen Jay Gould famously asked" (Lansing 2002:282). Lansing's answer is in terms of emergence: methodologies used in artificial-societies research offer the possibility of modeling alternative emergent outcomes of nonlinear processes involving heterogeneous actors and environments. Such models include terms not only for agents but also for the environments in which they are embedded, which acknowledge Lewontin's arguments in favor of niche construction. But such models also impress Lansing because they promise hypothetical answers to Gould's question, because the likelihoods of different, given social realities—their "propensities"—"turn out to be properties of the whole dynamical system" (2002:285).

Lansing's analysis takes the discussion of niche construction directly into the domain of complex cultural change and highlights a serious challenge: How can anthropologists do evolutionary theory in a way that articulates biological levels of organization (e.g., molecules, genes, cells, tissues, organs, organisms) to different and broader social, cultural, and environmental levels of organization (e.g., ecological systems, social systems, cultural systems)? Until now, the best anthropologists have been able to do is to conceive of societies, cultures, languages, and ecosystems as if they were organisms, leading to variations of Durkheimian or Boasian "holism." It would be extremely helpful if evolutionary anthropologists could find a way to think about structures beyond the organism in terms that were not always some version of the organism writ large.

Lansing's originality is to approach "cultural evolution" issues from a process perspective that foregrounds the production of complex relationality, rather than the reduction of complexity to the action of a prime mover. In this respect, his approach resonates with that of William Wimsatt, who calls himself a "philosopher of the inexact sciences" (2007:21)—that is, everything in between the largest and smallest things in the universe. But how does one do "a philosophy for messy systems, for the real world, for the 'in-between'" (Wimsatt 2007:6)? Must Ockham's razor be abandoned? Wimsatt's reply is that "with the right standards, one could remain an Ockhamite while recognizing a world that has the rich multi-layered and interdependent ontology of the tropical rain forest—that is, our world" (Wimsatt 2007:193–194).

Wimsatt's key criterion for what is real is "robustness," a concept he borrowed from ecologist Richard Levins: "Things are robust if they are accessible (detectable, measurable, derivable,

definable, producible, or the like) in a variety of independent ways" (2007:56, 195). What Wimsatt calls "robustness analysis" is sometimes also called "bootstrapping" or "triangulation" (2007:54); Griesemer (2006) recommends it as a method for testing alternative evolutionary models, and anthropologists know it well. As philosopher of archaeology Alison Wylie has observed, "triangulation on a single aspect of an archaeological subject is sometimes possible and important: the routine use of multiple lines of evidence to date an artifact, feature, or stratum testify to this. But more often diverse (independent) resources are used to constitute evidence of quite distinct aspects of a past context" (1996:328). She also notes that "when independence is realized in this sense, it ensures that, while observations are clearly loaded with theory … the theory with which they are loaded has no connection with the subject under investigation … evidence may sometimes have considerable autonomy from the hypotheses it is used to support or evaluate" (Wylie 1996:328).

It is Wimsatt's understanding of what is real in terms of what is robust that allows him to turn "reductionism" into "both target and resource." This is possible because, according to Wimsatt, there are at least two kinds of reduction. One kind, eliminative reduction, "is a kind of theory reduction … in which higher-level objects and relations are systematically eliminated in favor of lower level ones, rather than extended, modified, or transformed" (Wimsatt 2007:167); this is the target that must be destroyed. A second kind of reduction, however, can serve as a resource: namely, "the explanation of upper level phenomena and regularities in terms of lower-level mechanisms. It is never eliminative" (Wimsatt 2007:167; see also McKinnon and Silverman 2005b:1). This is because, Wimsatt insists, "robust higher-level entities, relations, and regularities do not disappear wholesale in lower-level scientific revolutions—our conceptions of them transmute and add new dimensions in interesting ways, yes, but disappear, no" (2007:168). Wimsatt is offering a relational, "process" philosophy of science in which "reduction," no longer eliminative, is transmuted into tracing the ways lower-level and higher-level phenomena articulate. He shows how attempts to argue for the eliminative reduction of robust higher-level phenomena rest on a series of "functional localization fallacies" (2007:61), which he enumerates in great detail (and which every anthropologist will recognize). Finally, Wimsatt is not bound to a totalitarian view of human culture: "Our cognitive capabilities and institutions are not less engineered and re-engineered than our biology and technology, both collections of layered kluges and exaptations" (2007:6).

Lansing's recent work *Perfect Order: Recognizing Complexity in Bali* (2006) offers a glimpse of what can be revealed when attention is paid to the way heterogeneous lower-level and higher-level phenomena articulate, sustain, and feed back on one another, over time and across space. From one chapter to the next, Lansing's book exposes the emerging materiosemiotic processes and historical contingencies that have coproduced the complex infrastructure that supports contemporary Balinese self-understanding. Robust higher-level entities, relations, and regularities do not disappear but, rather, are scaffolded by (and feed back on) entrenched lower-level phenomena. Lansing makes clear that nothing but the constant, laborious intervention of human agents can stabilize relations among heterogeneous higher-level entities. When agency successfully articulates with infrastructure, however, the Balinese cultural model of "perfect order" emerges.

Paying attention to niche construction permits Lansing to show how contingent processes set in motion generations ago have given rise to elaborate cultural structures that have become increasingly stabilized and "foundational" as they have come to serve as scaffolding for additional processes and structures that have emerged over the course of Balinese history. Exposing the scaffolding allows Lansing to "remove the proximate mystery" that would make the existence (and persistence) of these heterogeneous, convoluted, entrenched cultural forms otherwise hard to explain. As we saw in Foley's processual account of linguistic history, however, some scholars who have adopted relational evolutionary approaches resist acknowledging openly the existence of scaffolding. Such resistance seems to reflect commitment to process accounts that concentrate attention (and material agency) in organisms. In 1990, for example, in response to "the final disappearance of the organism from modern biology" that followed the triumph of neo-Darwinian views, Ingold deliberately proposed "an alternative biology that takes the organism as its point of departure" (1990:209). Because "neo-Darwinian sociobiology leaves us without a theory of the person," Ingold also proposed an alternative anthropology that takes persons as the point of departure, insisting that the organism and the person are one (1990:209, 220). "In recapturing persons for anthropology," he declared, "I follow the same approach as in my recapturing organisms for biology" (Ingold 1990:209). "The environment," clearly essential to the developmental genesis of organism or person, remained indistinct and untheorized.

I believe that Ingold's goal of bringing the anthropology of persons within the biology of organisms will never succeed unless the "the environment" itself is "recaptured"—both for biology and for anthropology. On the basis of the foregoing arguments, moreover, I would insist that the environment and the constructed niche are one, for all organisms, not just for humans. In fact, by 2004, Ingold's treatment of the environment had changed, although his ambivalence still shows. He returned to his familiar example of walking, contrasting the traditional "shuffling gait" in rural Japan with the upright, striding gait of Europeans, and each walker's activity was now contextualized within a more fully characterized constructed niche. For the Japanese person, this included sandals on the feet, a long pole with heavy loads at either end slung over one shoulder, and the steep terrain over which the walker must make his or her way. For upright, striding Europeans, he observed that "carrying devices, from rucksacks to suitcases are designed with this posture in mind" (Ingold 2004:216). It is somewhat disappointing that, in summarizing this example a few lines later, the material scaffolding (footwear, the pole with its loads, and rucksacks and suitcases) has disappeared, and walking is described only as the product of "practice and training within an environment that includes skilled caregivers and a certain terrain (Ingold 2004:216). Nevertheless, Ingold acknowledges almost immediately that people

> do not live their lives in a vacuum, but in a world where they are surrounded by other people, objects and places, making up what is usually known as the environment. Growing up in an environment largely shaped by the activities of their predecessors, human beings play their part, through their intentional activities, in fashioning the conditions of development for their successors. This is what we call history. (2004:217)

If an environment "exists only in relation to the organisms that inhabit it, and embodies a history of interactions with them" (Ingold 2004:218), what else can that environment be but a constructed niche?

If history is the process, then persons and organisms and constructed niches are all history's products. But if evolution is a process that includes development and embraces historical contingencies that may become entrenched as scaffolds for further biological or cultural elaboration, then evolution—biological or cultural—is a historical process. In that case, it might make sense to talk about cultural evolution as Wimsatt and Griesemer do, arguing that the role of culture in human life is best revealed by examining "the ways culture and genes interact to scaffold individual and group development in the context of social groups and social worlds (2007:253). The three kinds of scaffolding they identify—artifacts, infrastructure, and developmental-agent scaffolding (Wimsatt and Griesemer 2007:276)—all appear in Ingold's accounts of skills that are incorporated into organisms: artifacts like sandals, rucksacks, and poles with heavy loads; infrastructures like particular kinds of "terrain" (or the paths people make through them); and developmental agents like "skilled caregivers." Wimsatt and Griesemer cite with approval Ingold's view (2000) that dwellings are the products of "ongoing processes of dwelling, continuous and contiguous with our history of our species," but they also argue that dwellings are "prime exemplars and iconic metaphors of scaffolding that assume a central importance in our developmental account of cultural cumulation and change" (2007:235).

With this in mind, it becomes possible to recast, for example, the multigenerational data collected by Yanagisako (2002) on family firms active in the silk industry of Como, Italy, within an evolutionary framework that highlights the cultural scaffolding for development of families, firms, and individual, gendered, bourgeois subjectivities (including the sentiments that incite men to found families and firms). Yanagisako often talks about dwellings that scaffold individual developmental trajectories: family homes that shelter siblings, their spouses, and sometimes multiple generations and whose state of repair indexes their dwellers' degree of access to the family firm's economic success. Dwellings as scaffolds are "convenient, 'rationalized,' safe developmental contexts for particular things or kinds of things and acts of using them" and are "essentially relational" (Wimsatt and Griesemer 2007:276). In Como, the notion of "dwelling" might usefully be expanded to include additional structured developmental niches in which crucial skills are scaffolded for some family members and not others: settings like technical schools, universities, or firms where future managers serve apprenticeships. All these dwellings may be regarded as materiosemiotic components of even more intricate class-fraction-based constructed niches, within which the gendered subjectivities of individuals (and the sentiments that motivate them) are scaffolded. These locally constructed niches may become differentially entrenched as components of broader constructed niches that reach beyond Como, or even beyond Italy.

At the same time, changes in those broader constructed niches that impinge on families and firms may alter or undermine local scaffolding, as when lower birthrates and laws supporting the equality of women and men alter the opportunities to be scaffolded by dwellings of a particular kind, creating openings for girls into settings that scaffold for them the skills and sentiments that help them "grow into" managers of their own firms. Such an account only enriches Yanagisako's analysis of "how these individuals have arrived at the sentiments and desires that lead them to pursue the particular entrepreneurial projects that, in turn, have shaped both their families and the silk industry of Como" (2002:4).

Conclusion

What difference would it make if anthropology incorporated relational evolutionary thinking? First, by rejecting the mainstream "neo-Darwinian" position that ontogeny (development) contributes nothing to phylogeny (evolution), it decenters the focus on genes as prime movers, offering clear alternatives to eliminative reductionism. By acknowledging the evolutionary productivity of developmental processes, relational evolutionary perspectives could thereby help shift discussion away from sterile nature–nurture debates. Second, within this enlarged terrain, it will be possible to address matters of anthropological concern that "neo-Darwinian" perspectives either ignore or handle poorly. For example, all the relational approaches discussed here reveal the way structural features of evolutionary processes impinge on each other and how that articulation can give rise to new structures and functions that feed back on themselves, pushing the processes along sometimes surprising paths. Both biological and cultural evolution are reconfigured once the split between inside and outside processes is disallowed: otherwise mysterious events that appear to defy explanation begin to make sense when the underlying processes and infrastructures that scaffold them are acknowledged. This is evident in Smith's and Lansing's endorsements of niche construction: both show that the historicity of culture is not threatened but explained by cultural evolutionary models in which biological development plays a central role.

Third, interesting parallels emerge when processes are compared: the "constructivist interactionism" of heterogeneous resources of DST and the structural coupling associated with natural drift echo actor-network theory's disclosure of heterogeneous articulations between living and nonliving, human and nonhuman, actants in science studies, which is echoed again in niche construction's insistence on linking living and nonliving components of ecosystems. These perspectives further resonate with process approaches adopted by archaeologists and cultural anthropologists influenced by science studies (Hodder 2005; Meskell 2005; Tsing 2005) and by cultural anthropologists who draw both on science studies and the writings of Gilles Deleuze and Felix Guattari to make sense of complex, emerging, and heterogeneous social, political, and economic assemblages (e.g., Ong and Collier 2005). Much work remains to be done exploring the similarities, differences, and potential interconnections among these views. Still, philosopher of science Isabelle Stengers (2002) has recently reread the work of Deleuze and Guattari together with the process philosophy of Alfred North Whitehead, who inspired Waddington (Ingold has been reading all three for years; see Ingold 1990). Is it utopian to imagine the emergence of a relational evolutionary discourse in anthropology flexible enough to accommodate productive conversations across the subfields? Perhaps. Nevertheless, I believe that relational evolutionary thinking offers a viable and exciting alternative to mainstream evolutionary views that many beleaguered anthropologists will be able to affirm without ambivalence.

Notes

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1. These two projects may seem at cross purposes, reflecting tensions present in the text itself. This is perhaps also illustrated by the fact that Kevin Laland is a coauthor both of *Niche Construction* with Odling-Smee and Feldman and of "Towards a Unified Science of Cultural Evolution" with Alex Mesoudi and Andrew Whiten.

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